

CLAIMS

1. A method of determining that a signal has arrived at a receiver via a repeater, comprising:
 - a) receiving a signal at a wireless receiver;
 - b) comparing a predetermined pattern to information derived from the received signal; and
 - c) determining, based upon the predetermined pattern substantially matching the information derived from the received signal, that at least a portion of the received signal traveled via a repeater.
2. The method of Claim 1, wherein the predetermined pattern reflects a composite signal comprising a primary transmission signal of a base station transmitter mixed with a different secondary signal.
3. The method of Claim 2, wherein the different secondary signal is a signal obtained from a distinct base station transmitter.
4. The method of Claim 1, wherein the predetermined pattern reflects a relationship between time of arrival of signals obtained from distinct base station transmitters.
5. The method of Claim 1, wherein the predetermined pattern reflects relative strength of signals obtained from distinct base station transmitters.
6. The method of Claim 5, wherein the predetermined pattern further reflects relative time of arrival of signals from a multiplicity of different base station transmitters.
7. The method of Claim 6, wherein the signals are pilot symbols transmitted synchronously from a plurality of different base stations of a cellular telephone system.
8. Apparatus for determining that a signal has arrived at a receiver via a repeater, comprising:
 - a) a receiver configured to derive information from a received wireless signal; and
 - b) a processing system in communication with the receiver and configured to:
 - i) compare the information derived from the received signal to a stored set of predetermined parameters, and
 - ii) determine that at least a portion of the received signal arrived via a repeater if the set of predetermined parameters describes an appropriate part of the information derived from the received signal.

9. The apparatus of Claim 8, wherein the derived information reflects a relative time of arrival of distinct pilot sequences within the received signal.
10. The apparatus of Claim 8, wherein the derived information reflects relative signal strength of distinct pilot sequences within the received signal.
11. The apparatus of Claim 10, wherein the distinct pilot sequences include pilot sequences transmitted by distinct base station transmitters, and the derived information reflects a relative time of arrival of the distinct pilot sequences.
12. The apparatus of Claim 8, wherein the stored set of predetermined parameters reflects a composite signal comprising a primary transmission signal of a base station transmitter mixed with a different secondary signal.
13. The apparatus of Claim 8, wherein the information derived from the received signal includes time of arrival and relative signal strength for each of a multiplicity of signals from distinct signal sources.
14. The apparatus of Claim 13, wherein the receiver is a GPS-enabled cellular telephone handset configured to process CDMA signals, the multiplicity of signals include pilot signals from different CDMA base station transmitters, and the relative signal strength is related to chip energy divided by total signal.
15. A method of creating a database having predetermined patterns for use in the method of Claim 1, comprising:
 - a) receiving a signal at a wireless receiver;
 - b) identifying a pattern within information derived from the received signal; and
 - c) storing parameters that describe the identified pattern as a reference repeater signature within the database.
16. The method of Claim 15, wherein the information derived from the received signal comprises a constellation of signal parameters for signal components of a composite signal.
17. The method of Claim 16, wherein the constellation of signal parameters includes an indication of signal strength and an indication of time of arrival for each of a plurality of components of the composite signal.

18. The method of Claim 17, wherein step b) further comprises identifying within the composite signal a plurality of component signal pairs, each pair arriving at times separated by a possible repeater excess delay.

19. The method of Claim 16, wherein step b) further comprises:

- i) deriving information about location of the wireless receiver from parameters of a first set of component signals, and
- ii) determining that parameters of a second set of component signals are inconsistent with the derived location of the wireless receiver.

20. The method of Claim 15, wherein the wireless receiver is within a coverage area of a repeater server, and step b) further comprises comparing the information derived from the received signal with previous information derived from a signal received by a receiver differently located within the coverage area of the repeater server.

21. The method of Claim 15, further comprising revising an existing signature within the database based upon information derived from signals received by receivers determined on the basis of matching to the existing signature to be within a coverage area of a repeater associated with the existing signature.

22. Apparatus for creating a database having predetermined patterns for use in the method of Claim 1, comprising:

- a) a receiver configured to derive information from a received wireless signal; and
- b) a processing system configured to:
 - i) obtain the derived information from the receiver,
 - ii) analyze the derived information to identify a pattern of at least a portion of the derived information, and
 - iii) store a description of the identified pattern in a database as a repeater signature reference pattern for determining if subsequent received signals arrived via a repeater.

23. The apparatus of Claim 22, wherein the information derived by the receiver comprises a constellation of signal parameters for signal components of a composite signal.

24. The apparatus of Claim 23, wherein the receiver is further configured to derive information including an indication of signal strength and an indication of time of arrival for each of a plurality of components of the composite signal.

25. The apparatus of Claim 23, wherein the processing system is further configured to:

- i) derive information about location of the wireless receiver from parameters of a first set of component signals, and
- ii) determine that parameters of a second set of component signals are inconsistent with the derived location of the wireless receiver.

26. The apparatus of Claim 22, wherein the receiver is known to be located within a coverage area of a server of a repeater, and wherein the processing system is further configured to compare the information derived from the signal received from the receiver with information previously derived from a different signal received by a receiver differently located within the coverage area of the repeater.

27. The apparatus of Claim 22, wherein the processing system is further configured to

- i) determine that a subject receiver is within a coverage area of a repeater by comparing information derived from a signal received by the subject receiver with an existing repeater signature of the database, and
- ii) thereafter use the derived information of the subject receiver to modify the existing repeater signature.

28. A method of providing a composite signal to a repeater for distinguishing signals transmitted via the repeater from signals not transmitted via the repeater, the method comprising:

- a) obtaining a primary signal from a donor transmitter system;
- b) mixing at least one different secondary signal with the primary signal to create the composite signal;
- c) amplifying the composite signal for transmission from a repeater server antenna.

29. The method of Claim 28, wherein step b) further comprises coupling an antenna receiving one or more secondary signals to a donor connection of the repeater.

30. The method of Claim 28, further comprising d) creating the at least one different secondary signal by delaying the primary signal.

31. The method of Claim 28, wherein step a) further comprises obtaining the primary signal from a first sector of a base station, and further comprising d) obtaining the at least one different secondary signal from a different second sector of the base station.

32. The method of Claim 28, wherein step a) further comprises disposing a donor antenna configured to receive a signal from the donor transmitter system, and step b) further comprises causing the donor antenna to pick up the at least one different secondary signal from a different transmitter system.
33. The method of Claim 28, wherein step b) further comprises mixing a plurality of different secondary signals to create the composite signal.
34. The method of Claim 33, wherein step b) further comprises coupling an omnidirectional antenna to an element conveying a primary signal from the donor transmitter system.
35. Apparatus for establishing a composite signal for transmission by a repeater as identification of the repeater, comprising:
- a) a first coupler device configured to couple a primary signal source to a mixer;
 - b) a different second coupler device configured to couple a distinct secondary signal source to the mixer via a distinct second coupler device; and
 - c) a distinct third coupler device configured to couple a mixed composite of signals from the primary signal source and from the secondary signal source as a donor input to the repeater.
36. The apparatus of Claim 35, wherein the distinct second coupler device is an antenna configured to receive signals from signal sources that are substantially not coupled by the first coupler device.
37. The apparatus of Claim 36, wherein the second coupler antenna is a simple multi-directional antenna, the mixer is a joining point between a RF conductor from the second coupler antenna and a RF conductor from the first coupler device, and the distinct third coupler device is a RF conductor connected to an amplifier of the repeater.
38. The apparatus of Claim 35, further comprising a delay device configured to create at least a component of the distinct secondary signal source.
39. The apparatus of Claim 38, wherein the primary signal source is a first sector of a base station, the second coupler device couples a signal from a different second sector of the base station, and the mixer is configured to mix signals from the first coupler device, the second coupler device, and a delayed signal from the delay device as the donor input.

40. The apparatus of Claim 35, wherein the first coupler device is a first antenna configured to receive a first signal from a first base station, and the second coupler device is a different second antenna configured to receive at least one different second signal not substantially received by the first antenna.